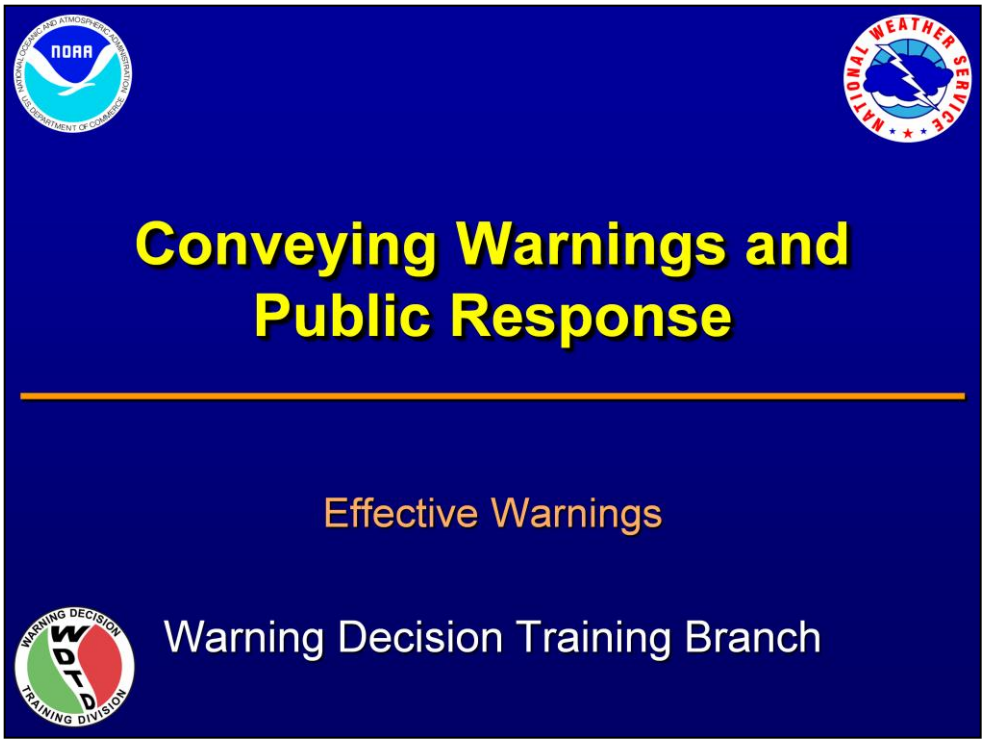


Welcome to this lesson on effective warnings. This lesson, which last approximately 20 minutes, focuses on how to issue effective warnings. The lead instructor for this presentation is John Ferree.

Overview

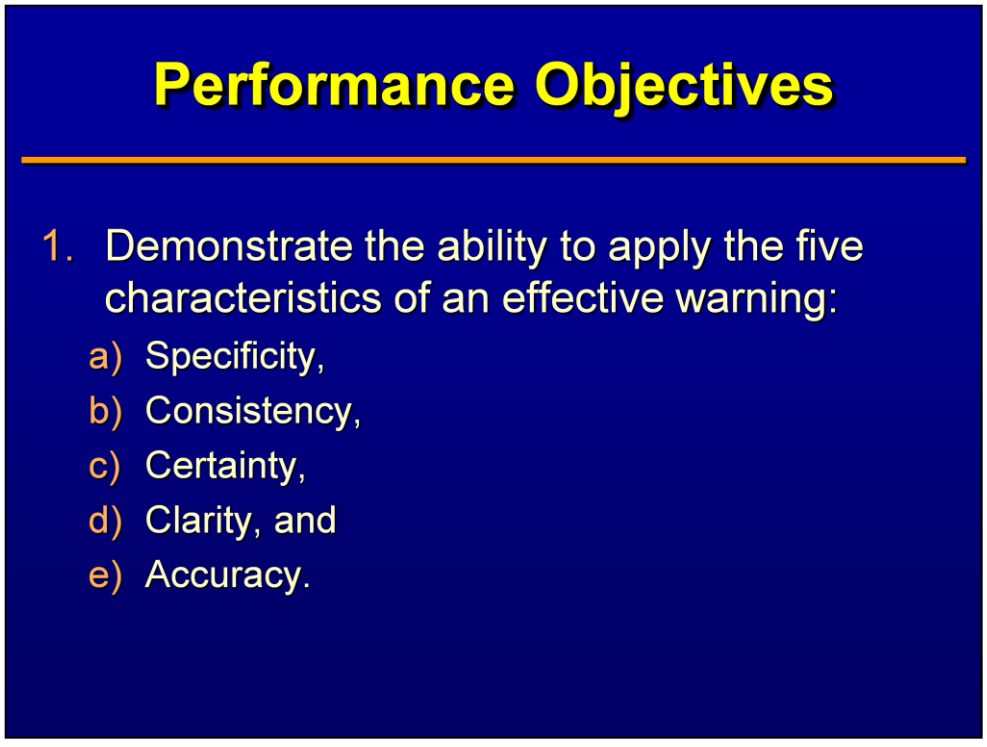
- Review of WFO Severe Weather Products Specifications
  - NWS Instruction 10-511
  - NWS Instruction 10-922
- What are the elements of an effective warning?

In this lesson we will first review the NWS “official” product specifications. Many of the elements of an effective warning are built into the product specifications. We will then discuss the elements of an effective warning, and discover ways to deliver effective warnings.

Learning Objectives

1. According to NWS Instruction 10-511, be able to identify specifications of WFO Severe Weather Products.
2. Be able to name five characteristics of an effective warning.
3. Be able to identify effectively worded warning phrases.

There are only three objectives to this lesson.

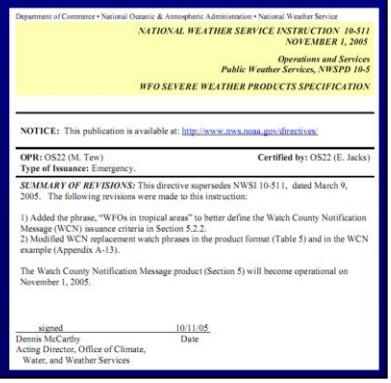


There is one performance objective for this lesson. This performance objectives is a statement of the behaviors that participants will be able to demonstrate both in the simulations and on the job.

NWS Instruction 10-511 Highlights

http://www.weather.gov/directives/sym/pd01005011curr.pdf

- **Severe Thunderstorm Warning (SVR)**
- **Tornado Warning (TOR)**
- **Severe Weather Statement (SVS)**
- Watch County Notification Message (WCN)



Department of Commerce • National Oceanic & Atmospheric Administration • National Weather Service

NATIONAL WEATHER SERVICE INSTRUCTION 10-511
NOVEMBER 1, 2005

Operations and Services
Public Weather Services, NWSPD 10-5

WFO SEVERE WEATHER PRODUCTS SPECIFICATION

NOTICE: This publication is available at: http://www.nws.noaa.gov/directives/

OPR: OS22 (M. Tew) **Certified by:** OS22 (E. Jacks)
Type of Issuance: Emergency.

SUMMARY OF REVISIONS: This directive supersedes NWSI 10-511, dated March 9, 2005. The following revisions were made to this instruction:

1) Added the phrase, "WFOs in tropical areas" to better define the Watch County Notification Message (WCN) issuance criteria in Section 5.2.2.
2) Modified WCN replacement watch phrases in the product format (Table 5) and in the WCN example (Appendix A-13).

The Watch County Notification Message product (Section 5) will become operational on November 1, 2005.

signed 10/11/05
Dennis McCarthy Date
Acting Director, Office of Climate, Water, and Weather Services

A quick review of NWS Instruction 10-511 will be our starting point for a discussion of effective warnings. The focus here is on Severe Thunderstorm Warnings, Tornado Warnings, and Severe Weather Statements. Watch County Notification Message is available in other training sessions (not in AWOC).

NWS Instruction 10-511 Highlights

http://www.weather.gov/directives/sym/pd01005011curr.pdf

- Severe Thunderstorm Warning (SVR)
  - Gust of 50 kts (58 mph) and/or
  - Hail size criterion has changed to 1 inch (quarter) diameter or larger
  - Valid times should be **30 to 60** minutes
  - If Tornado Watch, include possibility of tornadoes
  - Should **not** combine with Flash Flood Warnings

Some of the highlights from the instruction on Severe Thunderstorm Warnings.

NWS Instruction 10-511 Highlights

http://www.weather.gov/directives/sym/pd01005011curr.pdf
Starting page 7

- Tornado Warning (TOR)
  - Tornado
  - Valid times should be **15 to 45** minutes

Highlights from the instruction on Tornado Warnings.

NWS Instruction 10-511 Highlights

http://www.weather.gov/directives/sym/pd01005011curr.pdf
Starting page 4

- SVR and TOR
  - Should use nine part directions (I.e. northeast, east central, etc.) to identify portions of counties
  - Moves over coastal water -> Special Marine Warning
  - Keep bullets brief
  - Include call to action statements
    - May discontinue during widespread severe weather outbreaks
  - May use mileage markers of major highways as reference points

Instructions common to both Severe Thunderstorm Warnings and Tornado Warnings.

NWS Instruction 10-511 Highlights

http://www.weather.gov/directives/sym/pd01005011curr.pdf
See page 10

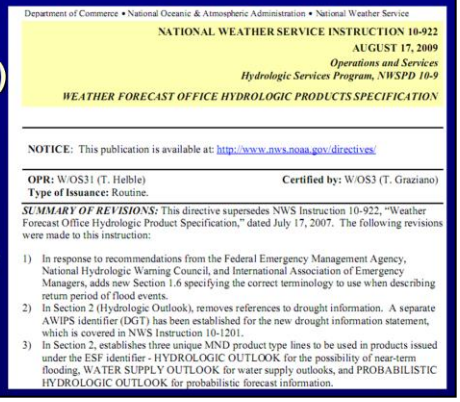
- Severe Weather Statement (SVS)
  - Include updated location
  - Include reports
  - Portions canceled or expired
  - **At least once** during valid time
  - Notify of expiration or erroneous counties
  - Include call to action statements if suspended in warnings

Highlights from the instruction on Severe Weather Statements.

NWS Instruction 10-922 Highlights

http://www.nws.noaa.gov/directives/sym/pd01009022curr.pdf

- Hydrologic Outlook (ESF)
- Flood Watch (FFA)
- **Flash Flood Warning (FFW)**
- **Flash Flood Statement (FFS)**
- Flood Warning (FLW)
- Flood Statement (FLS)
- Hydrolometeorological Coordination Message (HCM)
- RVS, RVA, RVD, RRx, Hyx, AHPS



Department of Commerce • National Oceanic & Atmospheric Administration • National Weather Service

NATIONAL WEATHER SERVICE INSTRUCTION 10-922
AUGUST 17, 2009
Operations and Services
Hydrologic Services Program, NWSPD 10-9

WEATHER FORECAST OFFICE HYDROLOGIC PRODUCTS SPECIFICATION

NOTICE: This publication is available at: http://www.nws.noaa.gov/directives/

OPR: W/OS31 (T. Helble) **Certified by:** W/OS3 (T. Graziano)
Type of Issuance: Routine.

SUMMARY OF REVISIONS: This directive supersedes NWS Instruction 10-922, "Weather Forecast Office Hydrologic Product Specification," dated July 17, 2007. The following revisions were made to this instruction:

1) In response to recommendations from the Federal Emergency Management Agency, National Hydrologic Warning Council, and International Association of Emergency Managers, adds new Section 1.6 specifying the correct terminology to use when describing return period of flood events.
2) In Section 2 (Hydrologic Outlook), removes references to drought information. A separate AWIPS identifier (DGT) has been established for the new drought information statement, which is covered in NWS Instruction 10-1201.
3) In Section 2, establishes three unique MND product type lines to be used in products issued under the ESF identifier - HYDROLOGIC OUTLOOK for the possibility of near-term flooding, WATER SUPPLY OUTLOOK for water supply outlooks, and PROBABILISTIC HYDROLOGIC OUTLOOK for probabilistic forecast information.

Flash Flood Warning product specification is in NWS Instruction 10-922. The focus here is on Flash Flood Warnings and Statements. Refer to the instruction (link is in the subtitle) for information on the other WFO Hydrologic Products.

NWS Instruction 10-922 Highlights

http://www.nws.noaa.gov/directives/sym/pd01009022curr.pdf

See page 30

- Flash Flood Warning (FFW)
  - *"Short-term events which require immediate action to protect lives and property"*
    - Dangerous small stream or urban flooding
    - Dam or levee failures
  - Valid Time. *"… until flooding (requiring immediate actions to protect lives and property) is expected to end"*

A flash flood warning will be issued when:

a. Flash flooding is reported;
b. Precipitation capable of causing flash flooding is indicated by radar, rain gages, and/or satellite;
c. Local flash flood monitoring and prediction tools indicate flash flooding is likely;
d. The effective time of a pre-existing warning changes;
e. The geographical area covered by a pre-existing flash flood warning increases;
f. A dam or levee fails;
g. A sudden failure of a naturally-caused stream obstruction (including debris slide, avalanche, or ice jam) is imminent or occurring; or
h. Small basin hydrologic models indicate flash flooding for specific locations along small streams.

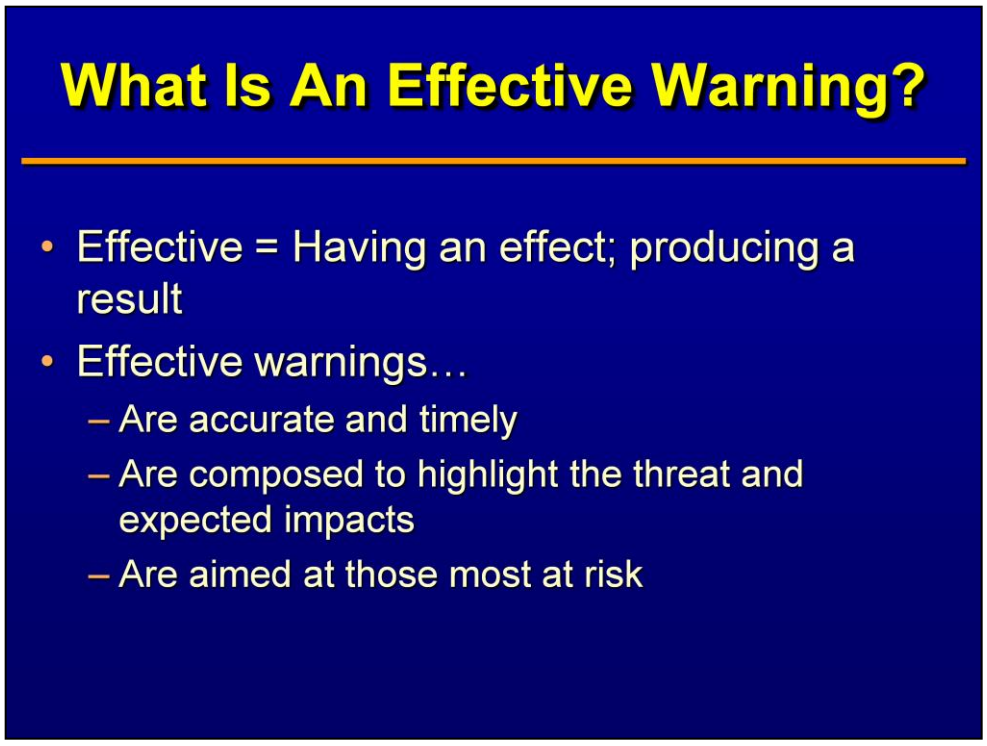
NWS Instruction 10-922 Highlights

http://www.nws.noaa.gov/directives/sym/pd01009022curr.pdf

See page 34

- Flash Flood Statement (FFS)
  - Supplemental information on current flash flood warning products
    - Updated observations
    - Impact information
  - Announce cancellation or expiration of a flash flood warning
    - Expires within 10 minutes of warning expiration

Flash Flood Statements should include the latest information on the current flash flood warning products. Focus on useful information that will help customers and partners direct mitigation activities where waters continue to present a danger to lives and property.



First we learned that you as the sender of information can impact public response. We then quickly reviewed the “requirements” for a thunderstorm warning. Now we will look at how you can issue effective warnings.

Use Technology to Help…

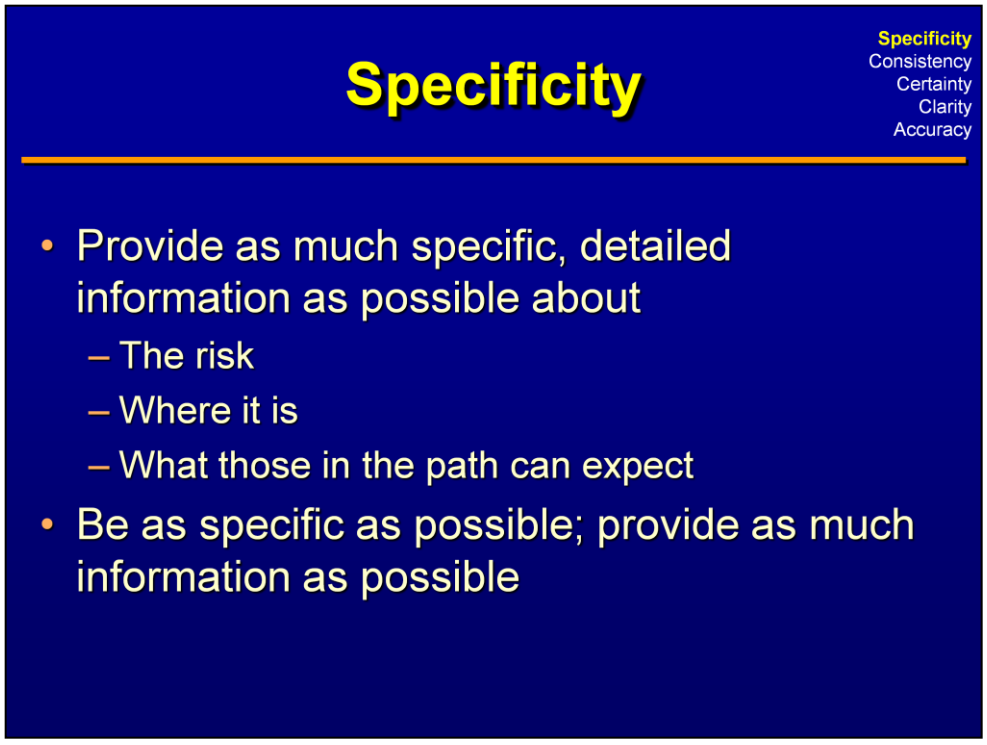
- AWIPS/Warngen
  - Issue warnings faster
  - Be sure technology does not mean good quality information is lost
  - It's still the forecaster's job to
    - Interpret radar/other information
    - Make the warning decision
    - Relay useful information via warnings and statements

Technology, such as AWIPS and Warngen, can help in the warning process, but the forecaster still has to make the warning decision and issue warnings and statements that meet the needs of the users.

Characteristics of Effective Warnings

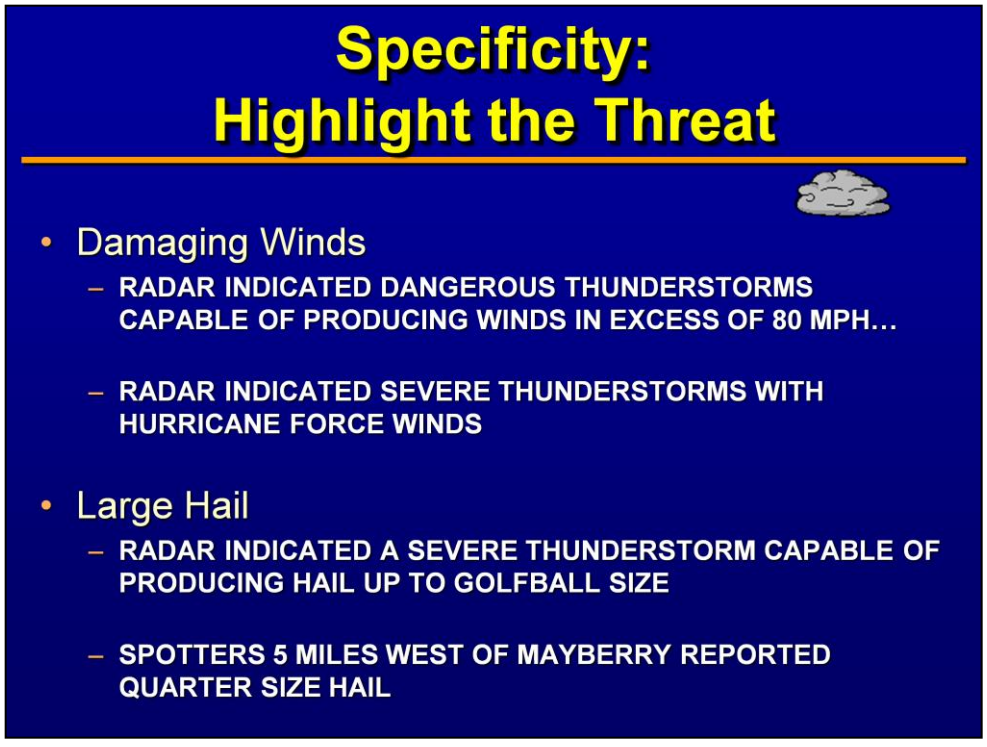
- Specificity
  - What, when, where
- Consistency
  - Internal/external
- Certainty
  - The tone of the message
- Clarity
  - Simple words with precise meaning
- Accuracy
  - Timely, accurate and complete information

Recall that the behavioral outcomes of the public in a warning situation are impacted by both the sender (issuing the warning) and receiver (those hearing the warning) factors. Severe weather warnings that include these five characteristics will have the best chance for a positive outcome.



Although the what, when, and where is a requirement in a severe weather warning, the warning forecaster has latitude in the specificity of the warning. There are many occasions when specificity cannot be high. Include what you know in the warning message, be as specific as possible without exceeding the capabilities of the science and technology.

An example of specificity comes from estimating a reasonable forecast of maximum winds in a warning. Some offices have worked with their EM community to blow sirens if expected winds exceed 65kts.



Be as specific as possible about the threat.

Specificity
Location, Location, Location

- Where is the storm?
- Where is it headed?

- Do people understand the storm positions and forecasts we provide?

Specificity
Location, Location, Location

- Use well-known locations
  - Larger cities, county seats
  - Interstate/other major highways
    - Mile markers/exits
  - Landmarks
    - Lakes, parks, etc

Specificity
Location, Location, Location

- What can we do to help travelers and others who are geographically challenged?

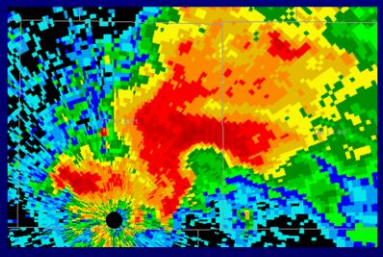
Specificity

- "… THE MAIN THREAT WITH THIS STORM IS DIME TO NICKLE SIZE HAIL. THE HAIL MAY CAUSE SOME VEHICLE OR ROOF DAMAGE. STRONG AND GUSTY WINDS UP TO 50 MPH CAN ALSO BE EXPECTED."
- "…THIS TORNADO WILL CROSS INTERSTATE 135 NEAR THE MEADOWS MALL…"
- "PEOPLE TRAVELING EAST ON INTERSTATE 40 BETWEEN EXITS 270 AND 275 SHOULD EXIT AND FIND SUBSTANTIAL SHELTER …IF POSSIBLE. GOLFBALL SIZE HAIL IS LIKELY WITH THIS STORM."

Here are three example of actual statements in warnings. With each statement, what are potential outcomes? Are these the desired outcomes?

Pathcasts

- WarnGen makes it easy
  - BUT!!
    - Are we that good???
    - Are we exceeding our abilities???



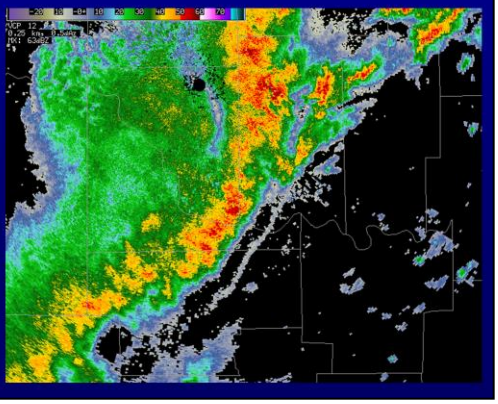
Pathcasts were intended to provide valuable information to users on where the tornado is expected to be during the course of a warning. However, its precision can easily be misused in providing users a false sense of security about where the tornado is expected to be. The science is not that good in forecasting specific locations and times that a tornado will be in the warning polygon.

Pathcasting Cautions

- Too much detail?
  - * THE TORNADO WILL BE NEAR
    HUTCHENS ELEMENTARY SCHOOL BY 715 AM
    MAGNOLIA GROVE GOLF COURSE BY 725 AM
    LOTT AND COLEMAN DAIRY ROADS BY 730 AM
  - * SEVERE THUNDERSTORM WILL BE NEAR
    GREEN HILLS MALL AT 1220 PM
    VILLAGE MALL AT 1220 PM
    ONE HUNDRED OAKS MALL AT 1225 PM
    HARDING MALL AT 1225 PM
    HICKORY HOLLOW MALL AT 1225 PM

Pathcasting Cautions

- WHAT are you tracking?
  - Gust front
  - Leading edge of precipitation
  - High reflectivity gradient
  - High reflectivity cores

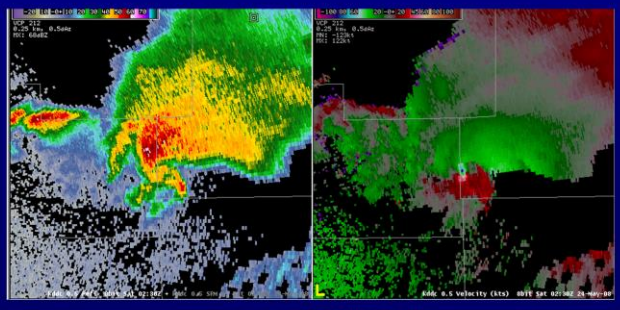


WHAT are you tracking?

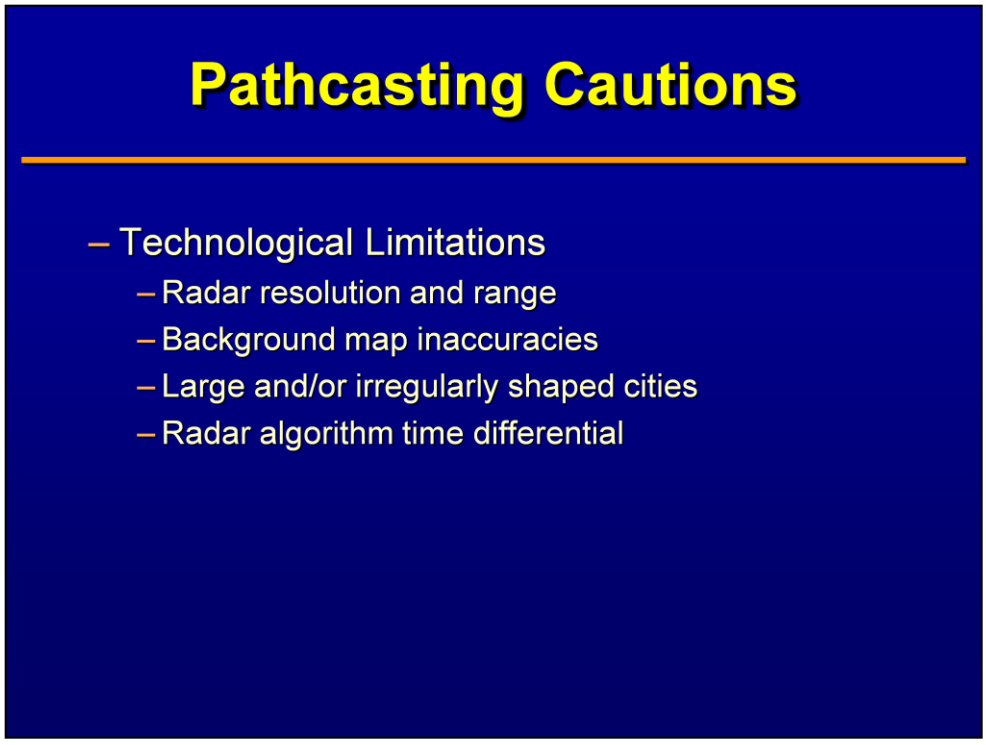
- Gust front
- Leading edge of precipitation
- High reflectivity gradient
- High reflectivity cores

Pathcasting Cautions

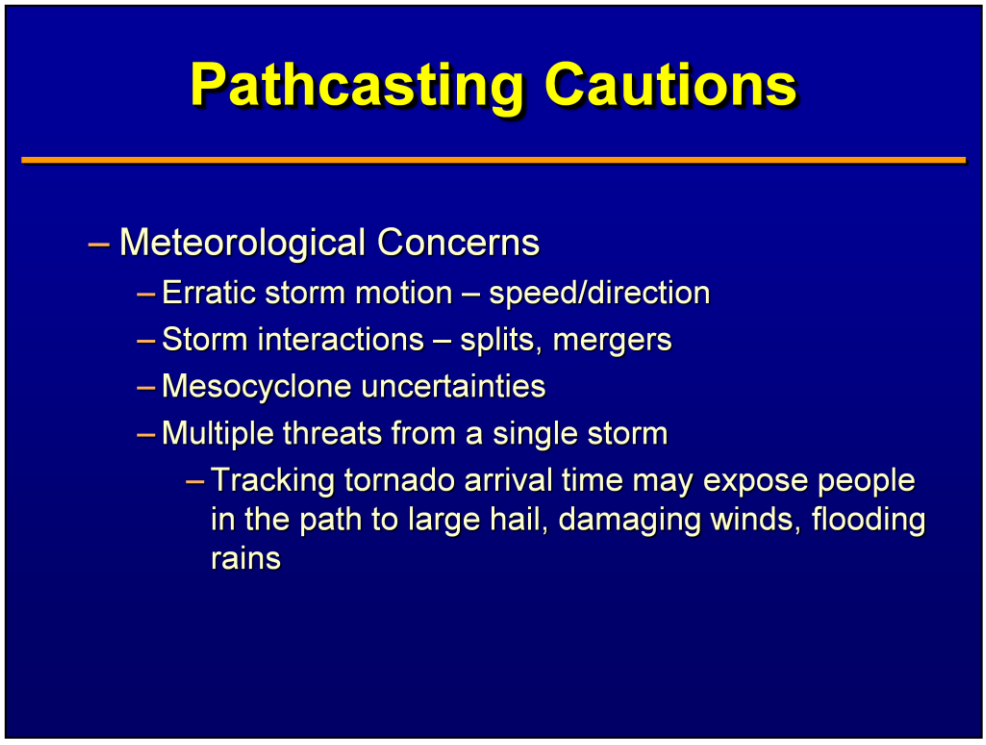
- WHAT are you tracking?
  - Tornado location
  - Mesocyclone
  - Leading edge of precipitation
  - Large hail core
  - Gust front



Another example is to make sure you track where the best possible location of where the tornado is and not the midlevel mesocyclone



Another caution of pathcasting is to not forget the limitations of your radar. Don't forget that the resolution of the radar and height of the beam increase as you get farther from the radar. There are map background inaccuracies. Cities are depicted as a point but don't forget that they have geographical extent. Algorithms are time-lagged.

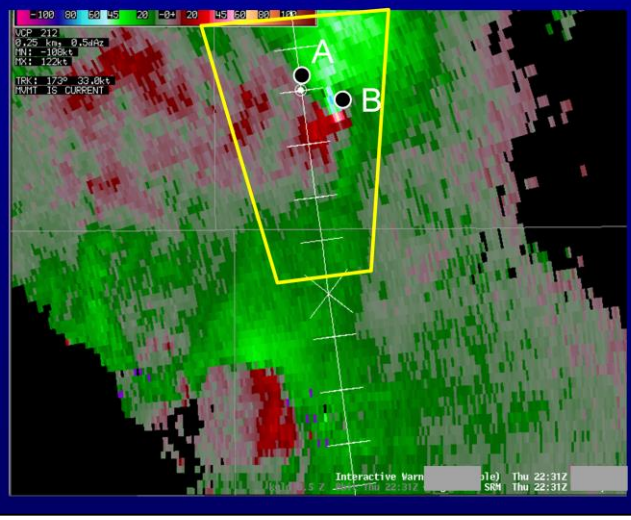


Meteorological concerns impact pathcasting including

- Erratic storm motion – speed/direction
- Storm interactions – splits, mergers
- Mesocyclone uncertainties
- Multiple threats from a single storm
  - Tracking tornado arrival time may expose people in the path to large hail, damaging winds, flooding rains

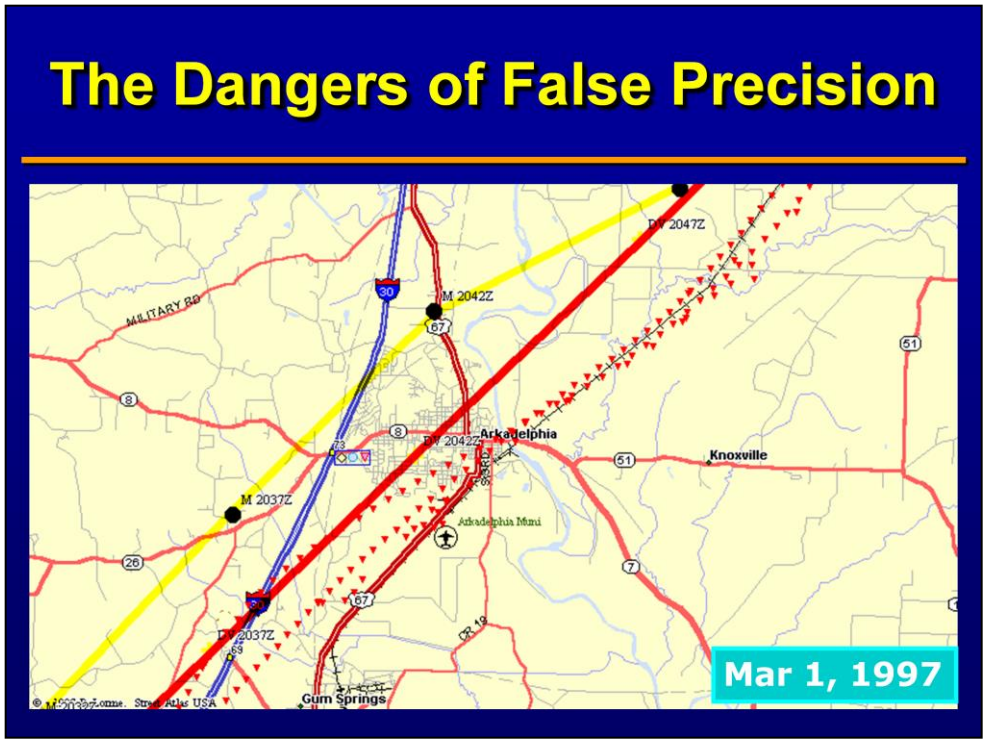
Pathcast Cautions: An Example

- An hypothetical example
- Town A is in the pathcast



Here is an example of why depending on pathcasts can lead to poor service. In this hypothetical example, there is a mesocyclone intensifying from 2212-2217 UTC that prompts you to issue a tornado warning outlined by the yellow polygon. Warngen allows you to track the track of the vortex, and that provides the basis for the general direction of the polygon. Consider towns A and B within the polygon. Notice that town A is directly on the extrapolated track and so it becomes mentioned in the pathcast. Five minutes into the warning, the vortex is close to the pathcast and all seems well. However by 2226 UTC (10 minutes in), the vortex has veered well to the right of your pathcast and is beginning to slow down more than you previously thought. And by 19 minutes into your warning, town B is seeing a tornado on its doorstep despite it not being mentioned in the pathcast. Yet town B is still well inside the tornado warning polygon.

These implications are why the Mother's day 2008 tornado outbreak service assessment stressed that pathcasts should not be emphasized because such previous emphasis caused a dangerous over-reliance on pathcasts.



Here is a comparison of tracks from the Mesocyclone algorithm (yellow), TVS algorithm (red), actual tornado (red triangles). The radar circulation signature may be some distance from where the tornado is occurring. This becomes an even greater problem using a linear extrapolation pathcast since the track will usually be non-linear.

Reference: **Correlation Between Tornado Damage Paths and WSR-88D Signatures, and Resulting Implications for the use of Pathcasts in Tornado Warnings**

Steven Piltz and Richard Smith: NWS, Tulsa OK

Making Pathcasts More Effective (realistic)

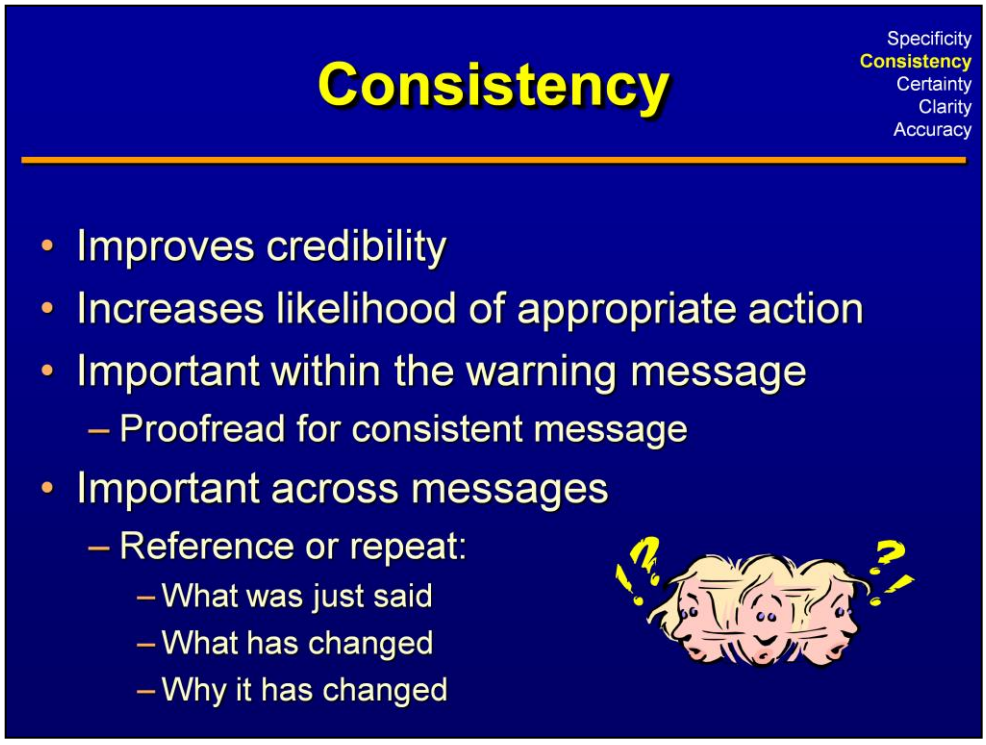
- Only forecast short distance ahead in initial warning with frequent updates
- Use range of arrival times based on storm type/threat/motion
- Simply mention towns in path for the valid period of the warning – more precise updates via the SVS

If you are compelled to use pathcasts, here are some suggestions on pathcasts.

Only forecast short distance ahead in initial warning with frequent updates

Use range of arrival times based on storm type/threat/motion

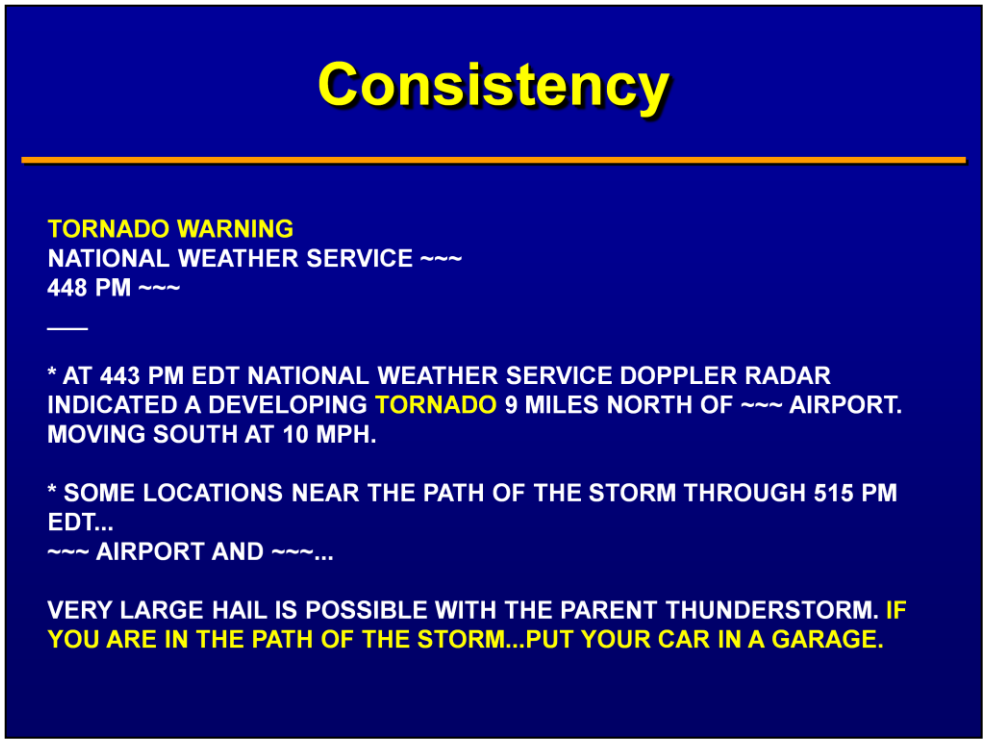
Simply mention towns in path for the valid period of the warning – more precise updates via the SVS



A consistent message is important in establishing the credibility of the message. Often different warning forecasters are writing warnings and statements, and sometimes neighboring offices will be writing statements about the same storm. Frequent communication within the office and between neighboring offices is necessary to ensure a consistent message.

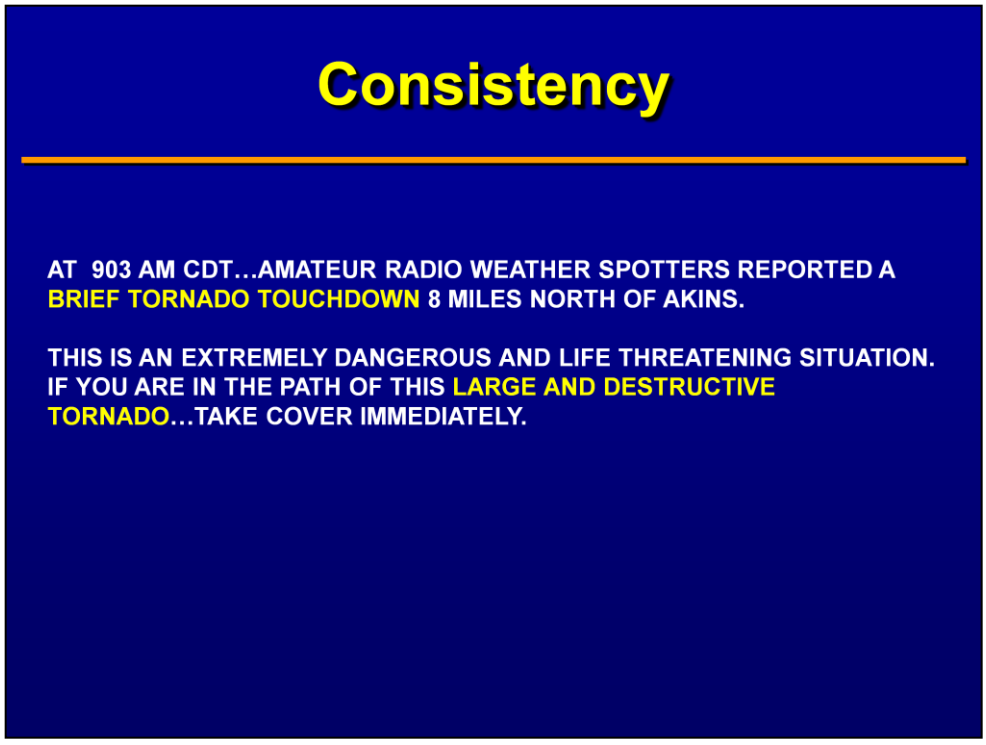
Use of the “Call-To-Action” statements in Warngen can sometime result in an inconsistent message within an individual warning or statement. A quick proofread of the warning prior to issuance can help keep the message consistent.

Keep the flow from message to message consistent by referencing or repeating previous statements.

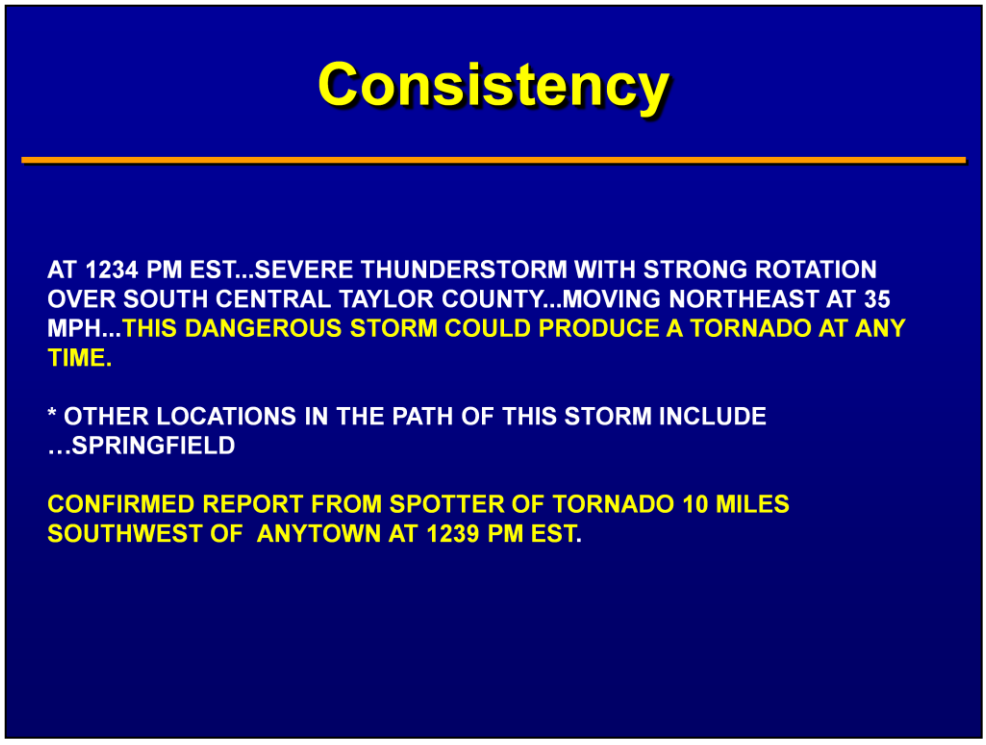


The intent might have been to indicate that the hail is in a different location than the tornado. This problem is the confused public may go outside to put the car in the garage as a tornado hits.

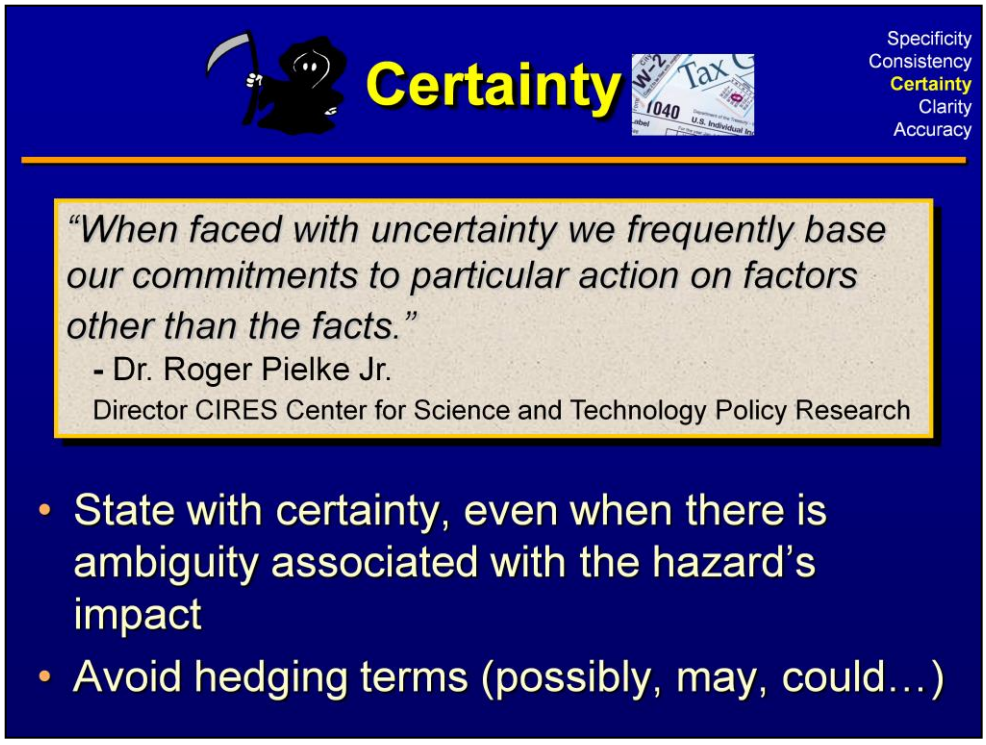
Call to action statements that are not consistent with the body of the warning happens more than we would like. Proofreading your warning for consistency of message before issuing may help.



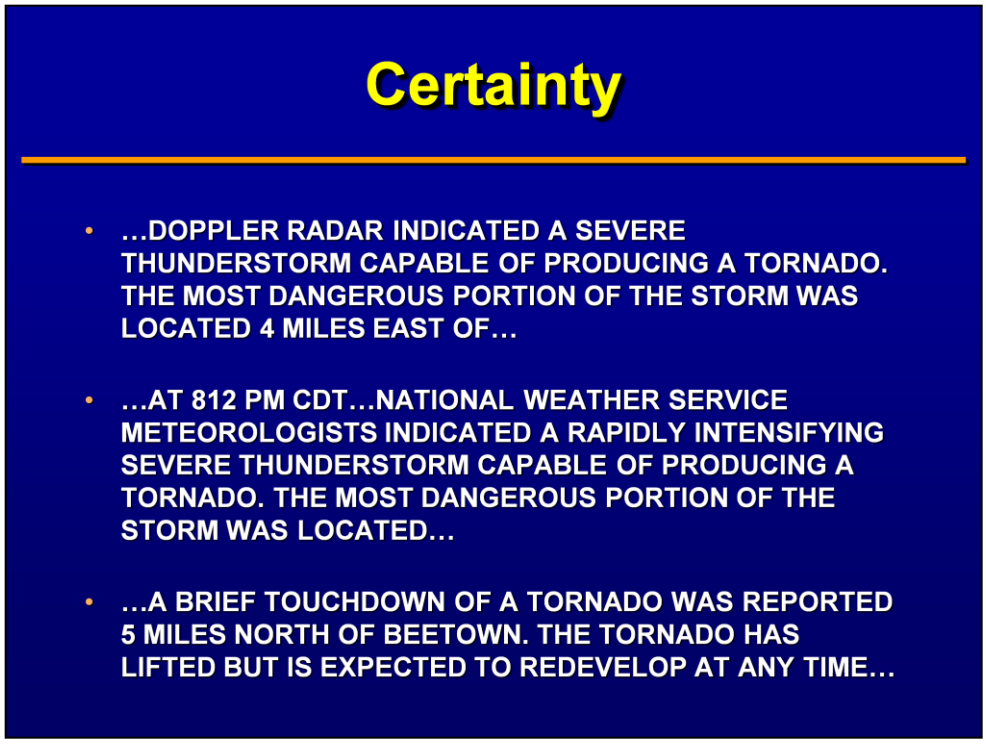
And another example of where call-to-action statements in Warngen can cause problems in consistency of the message.



Another example of where call-to-action statements in Warngen can cause problems in consistency of the message.



A warning message should be stated with certainty even in circumstances in which there is ambiguity associated with the hazard's impact. "Hedging" terms tend to spur the listener into "inaction" rather than action. Using terms which indicate action or development can fill the gap in listener's minds between "nothing's happening" to "it's too late now".

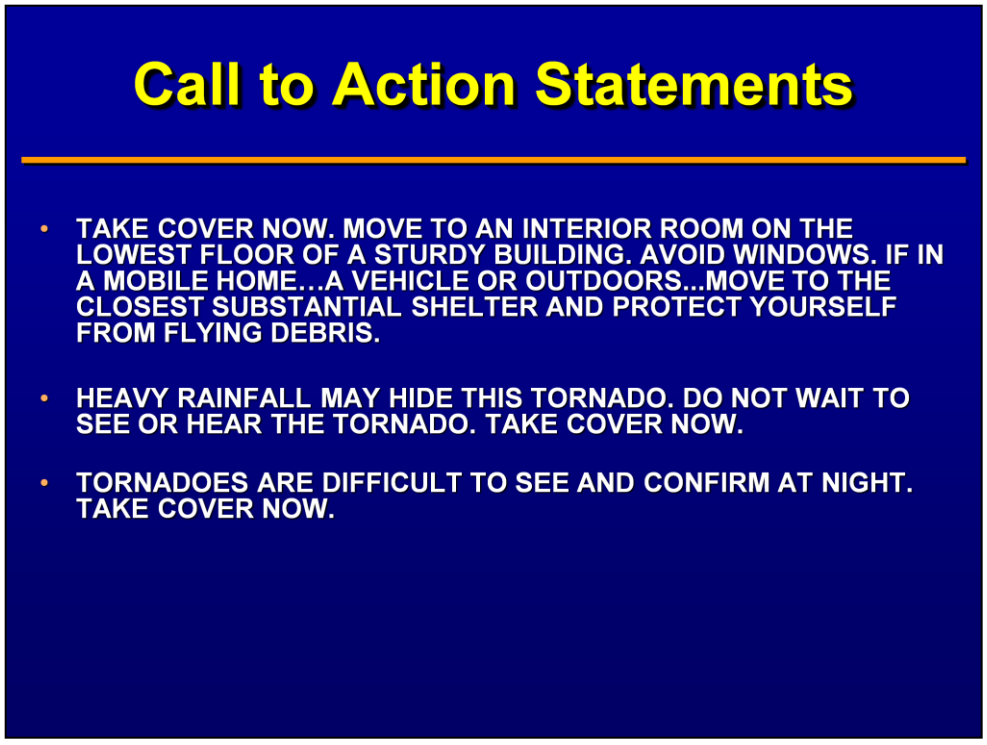


Even though the impacts in all of these situations are uncertain, these statements have included a degree of certainty that would tend to spur the listener to action.

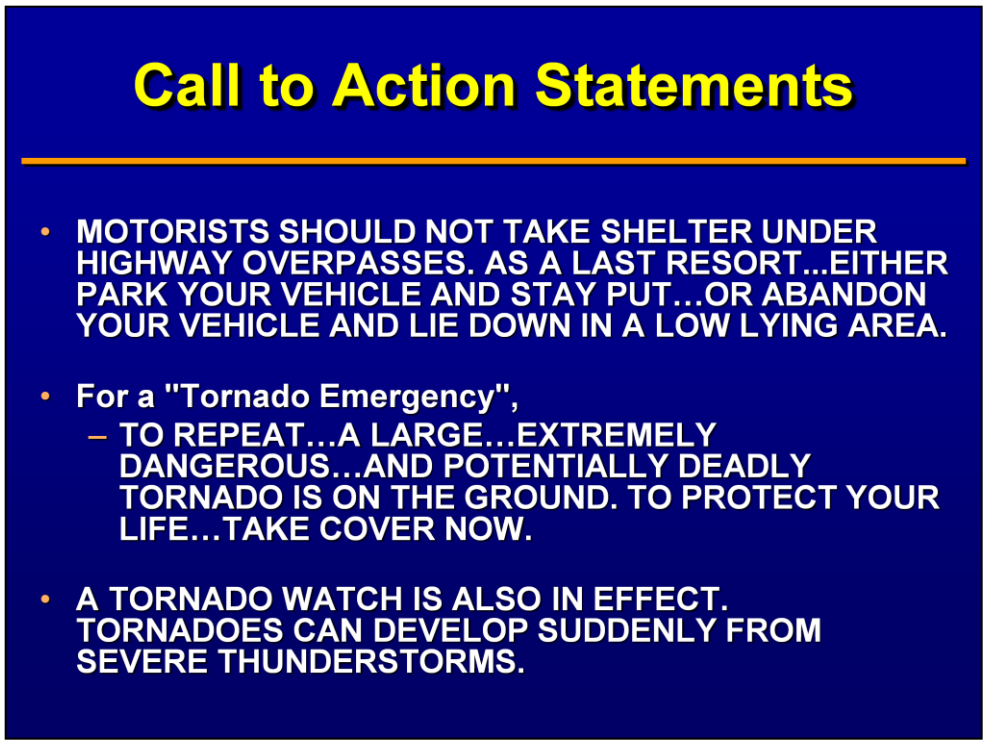
Clarity

Specificity
Consistency
Certainty
Clarity
Accuracy

- Warnings MUST be worded in simple language that can be understood
  - Tailored to your area
  - Avoid technical jargon
- Focus Call-To-Action statements
  - Impacts expected with THIS storm
  - Quick, targeted safety information
  - General statements about complicated subject
  - Focus on the MAIN threat
    - Can't give every possible safety rule



Clarity is especially important in “Call To Action” statements. Keep it simple!



More examples of simply worded “Call-To-Action” statements.

Clarity?

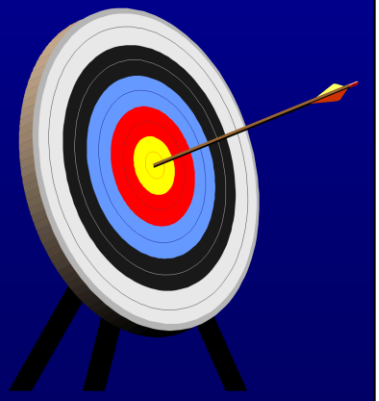
- SPOTTERS REPORT AN INCIPIENT TORNADO
- REPORTS HAVE BEEN RECEIVED THAT THE PARENT THUNDERSTORM PRODUCED TWO TORNADO FUNNELS
- THIS STORM HAS HAD A HISTORY OF PRODUCING A BRIEF TORNADO TOUCHDOWN
- A THUNDERSTORM NEAR THE TOWN OF OROVILLE REPORTED LARGE HAIL
- NUMEROUS REPORTS OF TORNADOES WERE REPORTED

What is wrong with each of these statements?

Accuracy

Specificity
Consistency
Certainty
Clarity
Accuracy

- Timely, accurate and complete information
- Simple typos, spelling, incorrect locations
- Header errors
  - e.g., SVR under SVS header

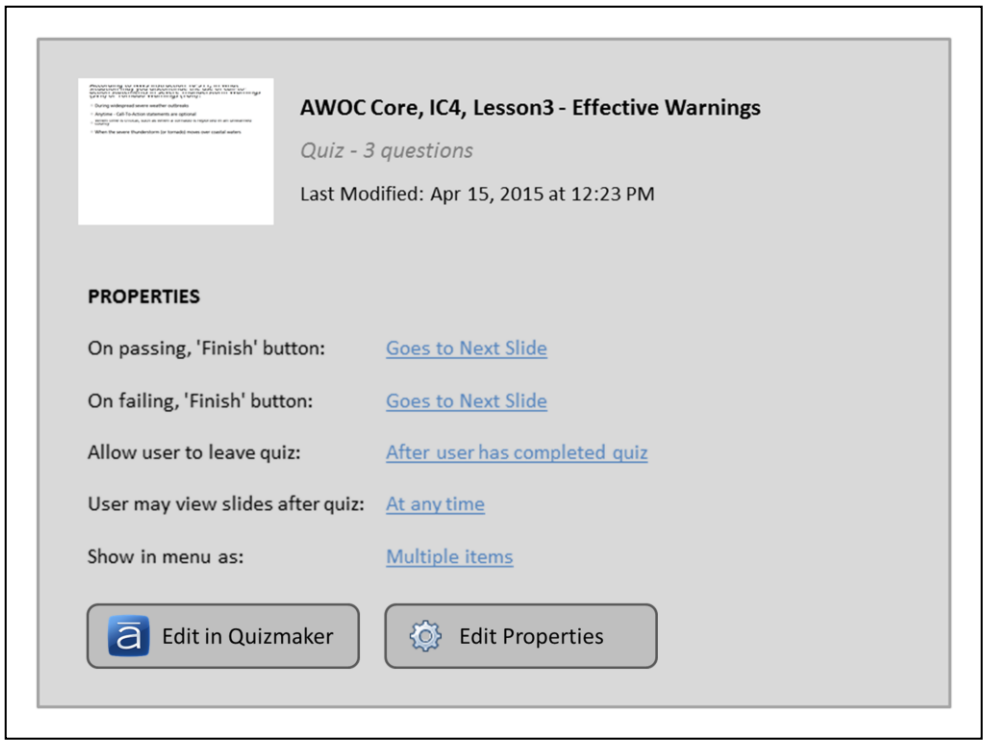


Accuracy

- AT 301 PM CST...DOPPLER WEATHER RADAR INDICATED A SEVERE THUNDERSTORM 162 MILES NORTH OF SALEM OR 155 MILES NORTH OF MOKO... MOVING NORTHEAST AT 40 MPH.
- HAIL UP TO 10 INCHES IN DIAMETER HAS BEEN REPORTED WITH THIS STORM
- THIS IS A VIOLENT THUNDERSTORM PRODUCING HUGH HAIL!

Characteristics of Effective Warnings

- Specificity
  - Where, when, what
- Consistency
  - Internal/external
- Certainty
  - The tone of the message
- Clarity
  - Simple words with precise meaning
- Accuracy
  - Timely, accurate and complete information


AWOC Core, IC4, Lesson3 - Effective Warnings
Quiz - 3 questions
Last Modified: Apr 15, 2015 at 12:23 PM
PROPERTIES
On passing, 'Finish' button:
Goes to Next Slide
On failing, 'Finish' button:
Goes to Next Slide
Allow user to leave quiz:
After user has completed quiz
User may view slides after quiz:
At any time
Show in menu as:
Multiple items
Edit in Quizmaker
Edit Properties

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- Communication of Emergency Public Warnings: A Social Science Perspective and State of the Art Assessment
  - Mileti and Sorensen, Aug 1990
- Correlation Between Tornado Damage Paths and WSR-88D Signatures, and Resulting Implications for the use of Pathcasts in Tornado Warnings
  - Steven Piltz and Richard Smith: NWS, Tulsa OK

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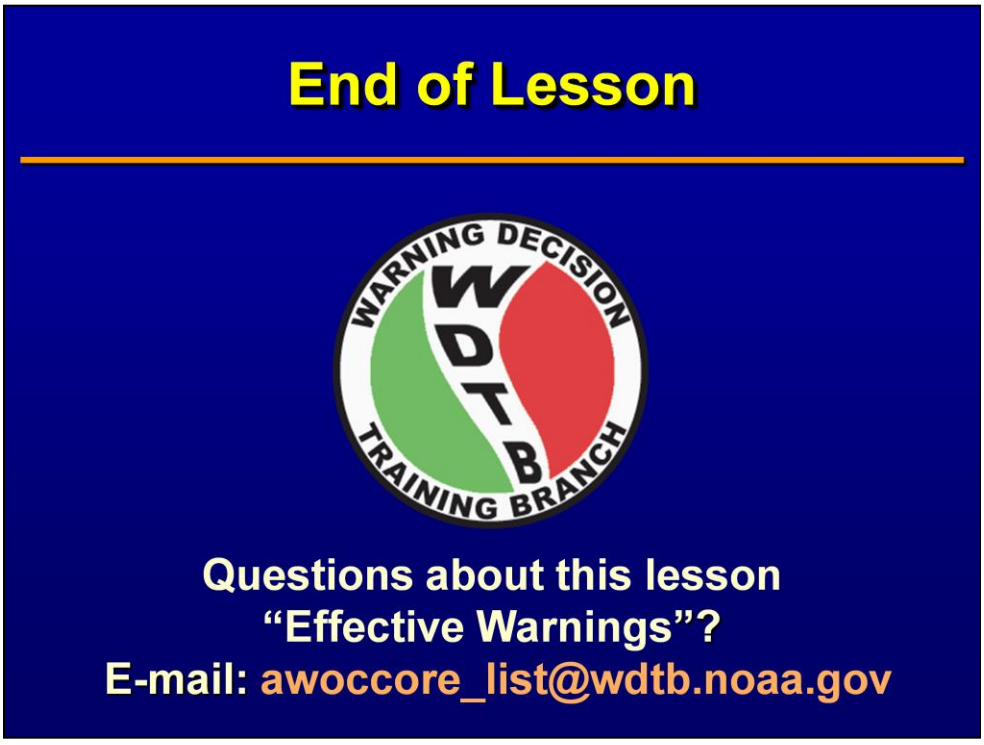
- Toward Improved Understanding of Warnings for Short Fuse Weather Events
  - Eve Gruntfest, March 2002
- Factors Related to Flood Warning Response
  - Denis S. Mileti, Nov 1996
- NWS Instruction 10-511 WFO Severe Weather Products Specification, November 2005
- NWS Instruction 10-922 WFO Hydrologic Products Specification, August 2009



You have completed this lesson on Effective Warnings. Please complete the remaining lessons in this Instructional Component before attempting the test required for completion. The test should be taken as soon as possible after completing all of the lessons.

If you have any questions about this lesson, first ask your training facilitator. If you need additional help, please send an e-mail to the address listed on the slide. Thank you for your time and good luck on the exam!